System Monitoring

SUNNY SENSORBOX

Installation Guide

Sensorbox-IUS084413 | 98-0003913 | Version 1.3

US

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IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This manual contains important instructions for Models SUNNY SENSORBOX - SYSTEM MONITORING UNIT, that shall be followed during installation and maintenance of the unit.

The Sunny SensorBox is designed and tested according to international safety requirements, but as with all electrical and electronic equipment, certain precautions must be observed when installing and/or operating the Sunny SensorBox. To reduce the risk of personal injury and to ensure the safe installation and operation of the Sunny SensorBox, you must carefully read and follow all instructions, cautions and warnings in this Installation Guide.

Warnings

A Warning describes a hazard to equipment or personnel. It calls attention to a procedure or practice, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the SMA equipment and/or other equipment connected to the SMA equipment or personal injury.

DANGER!

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING!

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION!

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE!

NOTICE indicates a situation that can result in property damage if not avoided.

Other Symbols

In addition to the safety and hazard symbols described on the previous pages, the following symbol is also used in this Installation Guide:

Information

This symbol accompanies notes that call attention to supplementary information that you should know and use to ensure optimal operation of the system.

General Warnings

General Warnings

All electrical installations must be done in accordance with the local and National Electrical Code ANSI/NFPA 70.

Before installing or using the Sunny SensorBox, read all of the instructions, cautions, and warnings on the Sunny SensorBox, the PV array, in this Installation Guide and in User Manual.

PV arrays produce electrical energy when exposed to light and thus can create an electrical shock hazard. Wiring of the PV-arrays shall only be performed by qualified personnel.

Only use the plug-in power supply delivered with the Sunny SensorBox. Use of alternate power supplies will void the warranty.

Warranty

The current guarantee conditions are available at www.sma-america.com and can be downloaded or are available on paper from the usual sales channels if required. For warranty coverage, or if you have questions about the Sunny SensorBox warranty, contact SMA America at the address, telephone number or Web site listed on page 3 (to send E-mail, see the Contact section of the SMA America Web site).

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1 Notes on this Manual

This manual describes how to mount, to electrically connect, and to commission the Sunny SensorBox and the external module temperature sensor. Store this manual where it will be accessible at all times.

1.1 Area of Validity

This manual applies to the Sunny SensorBox firmware version 1.3, and later, an hardware version B3, and later.

1.2 Target Group

This manual is for qualified personnel. Qualified personnel has received training and has demonstrated skills and knowledge in the construction and operation of the device. Qualified personnel is trained to deal with the dangers and hazards involved in installing electric devices.

2 Security

2.1 Appropriate Usage

With the Sunny SensorBox and the external sensors you can acquire environmental data at your PV system which is relevant to performance monitoring.

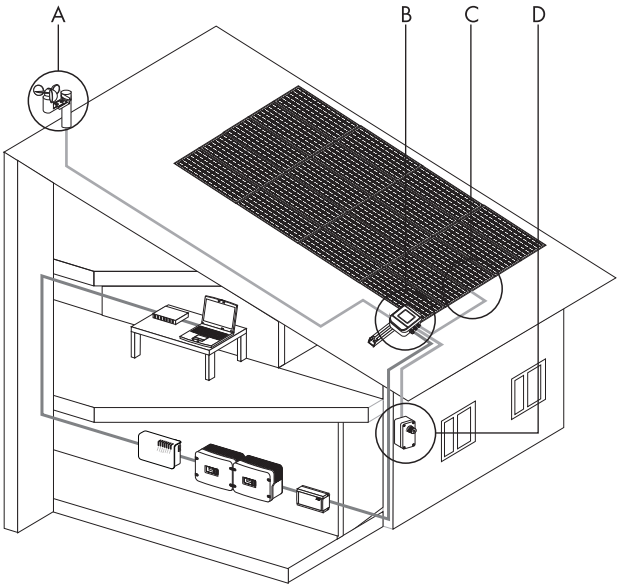
For this purpose, the Sunny SensorBox has an integrated irradiation sensor as well as an external module temperature sensor. In addition, you also have the option of connecting an ambient temperature sensor and/or an anemometer to the Sunny SensorBox.

The Sunny SensorBox is integrated into an RS485 communication bus. A maximum of 50 bus subscribers (incl. Sunny SensorBox) are allowed on the RS485 bus

The RS485-Power Injector provides the Sunny SensorBox with power, and must be mounted indoors. Up to 5 Sunny SensorBox devices can be connected to an RS485-Power Injector.

The Sunny SensorBox delivers the sensor data to the SMA communication devices via an RS485 interface:

- Sunny WebBox (Sunny WebBox firmware version 1.30 and later)



A Optional anemometer
B Sunny SensorBox with integrated irradiation sensor
C External module temperature sensor
D Optional ambient temperature sensor

Based on the strength of irradiation (W/m^2) of the integrated irradiation sensor and the recorded power of the PV system over one day, you can compare the PV power achieved and the measured strength of irradiation. If this data is observed over a longer period of time, the system constitutes a practical method of identifying a malfunction in the PV system. The gathered Sunny SensorBox data can be visualized via Sunny Portal (www.sunnyportal.com) or Flashview.

The Sunny SensorBox is only suitable for use with original accessories of SMA Solar Technology or with accessories recommended by SMA Solar Technology.

Also refer to the technical data of the Sunny SensorBox.

2.2 Safety Precautions

Follow all safety precautions in this manual. Failure to follow these instructions could result in damage to the device and in danger to persons.

DANGER!

Electric shock when opening the live inverter.

Death resulting from electric shock.

- All work on the inverter must be carried out by qualified personnel.
- Disconnect the inverter on the AC and DC sides as described in the inverter manual.

DANGER!

Falling from high altitude when mounting and installing the Sunny SensorBox.

Death or serious injury.

- Work on rooftops entails a safety risk, and requires special safeguards to be implemented. Works on rooftops should therefore only be done by qualified personnel which has been accordingly trained.

WARNING!

Risk of lethal electric shock when working on electrical terminals.

Death or serious injury due to electric shock.

- All electrical connections must only be carried out by qualified personnel.

NOTICE!

Overvoltage in case of lightning strike in the PV system.

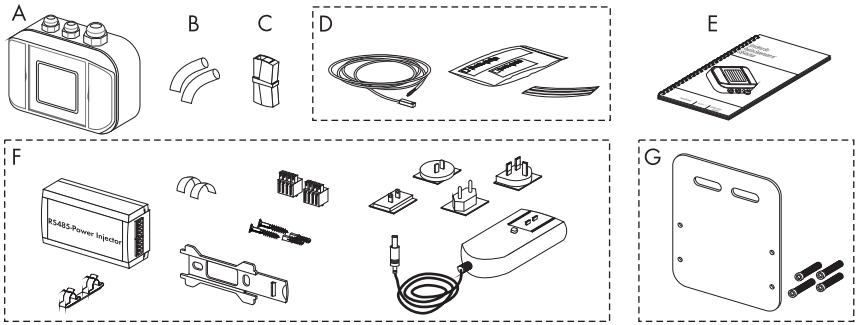
Destruction of ungrounded devices.

- All devices installed on a rooftop must be integrated in the existing lightning protection of the PV system.

3 Unpacking

3.1 Packing List

Check the delivery for completeness and for any external damage. Please contact your dealer if delivery is not complete or you find any damage.



The dashed boxes show products which belong together.

A 1 Sunny SensorBox (with integrated irradiation sensor)

B 2 Insulating tubes

C 1 Connection terminal

D 1 Module temperature sensor

incl. 1 thermally conductive adhesive (resin and hardener) and 2 adhesive tape strips

E 1 Installation guide

F 1 RS485-Power Injector

incl. 2 plugs, 1 bracket, 2 conductive adhesive foils, 2 screws, 2 screw anchors, 1 shield clamp and 1 plug-in power supply with 4 adaptors

G 1 Mounting plate for mounting on a module frame

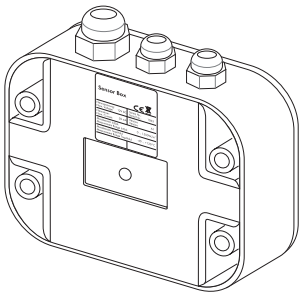
incl. 4 hexagonal screws

3.2 Identifying the Product

3.2.1 Type Plate

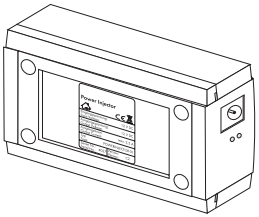
Sunny SensorBox

You can identify the Sunny SensorBox by means of the type plate. The type plate is located on the underside of the Sunny SensorBox.



RS485-Power Injector

You can identify the RS485-Power Injector by means of the type plate. The type plate is located on the underside of the RS485-Power Injector.



3.2.2 Firmware Version

The firmware version of the Sunny SensorBox is displayed as "FwVer" channel via the communication device.

4 Mounting the Device

This section describes the installation of the Sunny SensorBox, the RS485-Power Injector and the module temperature sensors.

4.1 Selecting the Mounting Location

4.1.1 Sunny SensorBox

Requirements for installation location of the Sunny SensorBox:

- The Sunny SensorBox is suitable for outdoor installation.
- The ambient temperature must be between -13 °F and + 158 °F.
- If the integrated irradiation sensor is used, the Sunny SensorBox must be installed at the same tilt angle and with the same orientation as the PV system in order to have measuring results that can be related to the system's yield.
- The installation location is to be selected according to the sensors used, taking into account the sensors' maximum cable lengths.
- Module temperature sensor: prefabricated cable length 8.2 ft. The cable may not be extended or cut.
- Ambient temperature sensor: maximum cable length 98 ft.
- Anemometer: prefabricated cable length 10 ft. (the cable may not be cut or only extended to a maximum of 98 ft.).
- The maximum cable length from the final Sunny SensorBox to the RS485-Power Injector is 492 ft.
- The maximum cable length of the entire RS485 communication bus is 4,000 ft.

4.1.2 RS485-Power Injector

Installation location requirements for the RS485-Power Injector:

- The RS485-Power Injector is only suitable for indoor installation.
- In the vicinity of a 120 V socket (cable length of the power supply approx. 70 in.).
- Protect the RS485-Power Injector from dust, moisture and corrosive substances.
- The ambient temperature must be between -4 °F and +149 °F.
- The maximum cable length from the final Sunny SensorBox to the RS485-Power Injector is 492 ft.
- The maximum cable length of the RS485 communication bus is 4,000 ft.

4.1.3 Module Temperature Sensor

Installation location requirements for the module temperature sensor:

- Select a solar cell which is never in the shade during the day.
- The module temperature sensor is adhered to the rear of the solar module.
- Observe the prefabricated cable length of 8.2 ft., the cable may not be extended or cut.

4.2 Mounting the Sunny SensorBox

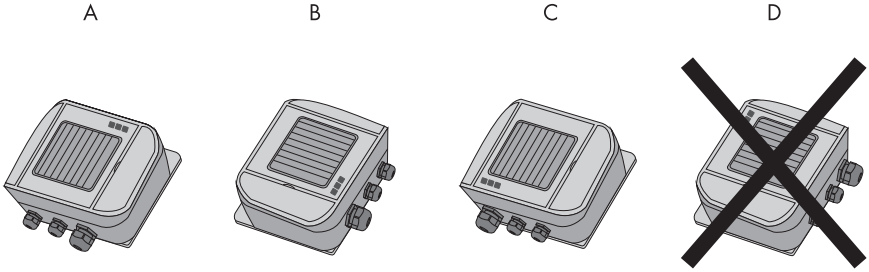
The Sunny SensorBox can be mounted on a module frame, or on a rafter.

NOTICE!

Ingress of water due to wrong mounting of the Sunny SensorBox.

Possible damage of the electronics of the Sunny SensorBox.

- The Sunny SensorBox may be mounted with three orientations.
- The Sunny SensorBox must not be installed vertically with the SMA logo at the top, as this allows water to enter the device (ventilation membrane).



A Permitted: Sunny Sensor Box mounted horizontally. SMA Logo is on the top right.

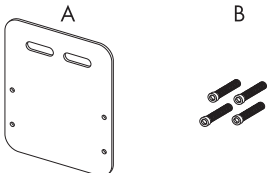
B Permitted: Sunny Sensor Box mounted vertically. SMA Logo is on the bottom right.

C Permitted: Sunny Sensor Box mounted horizontally. SMA Logo is on the bottom left.

D Prohibited: Sunny Sensor Box mounted vertically. SMA Logo is on the top left.

4.2.1 Mounting on a Module Frame

Mounting accessories provided

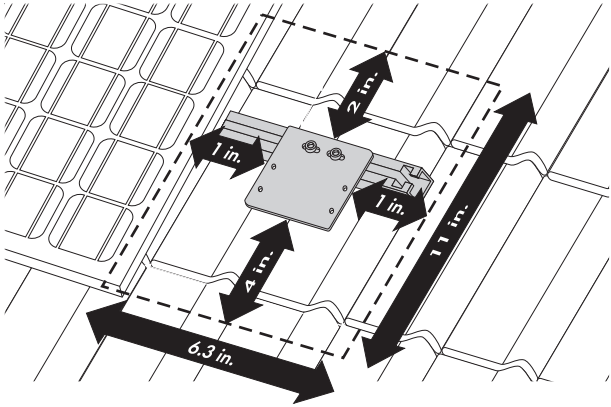


A	1	Mounting plate
B	4	Hexagonal screws

It is possible to mount the device on a module frame if the module frame protrudes about 6.3 in. out of the side of the modules. The mounting plate is separately available as well, see section 13 "Accessories" (page 59).

Mounting the Sunny SensorBox on a module frame

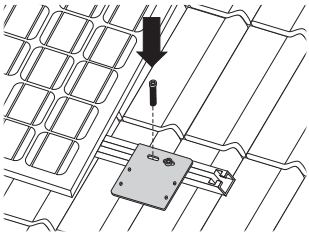
1. Determine the installation location considering the installation space and the orientation specified for the Sunny SensorBox (see page 18).



2. Attach the mounting plate to the module frame using 2 suitable screws and slot nuts (from the manufacturer of the module frame).

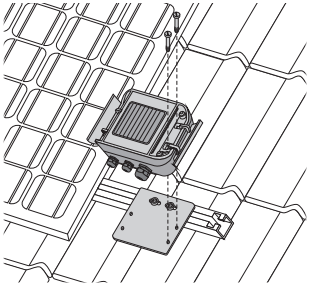
   Screws up to a maximum of 3/8" usually fit in the slot nuts from the manufacturers of the module frame.

3. Tilt the two flaps on the right and left side on the Sunny SensorBox towards the side (see also section 10.1 "Opening the Sunny SensorBox" (page 51)).



4. Fasten the Sunny SensorBox onto the mounting plate using the 4 screws provided. Observe the orientation of the Sunny SensorBox (see page 18).
5. Screw the 4 screws in a clockwise direction.
6. Make the connections to the Sunny SensorBox (see section 5 "Electrical Connection" (page 26)).

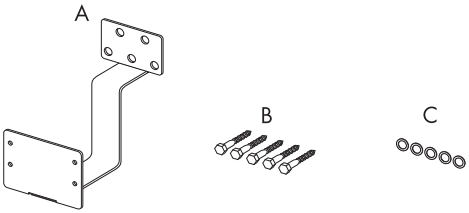
☑ The Sunny SensorBox is mounted on the module frame.



4.2.2 Mounting on a Rafter

Optional mounting accessories

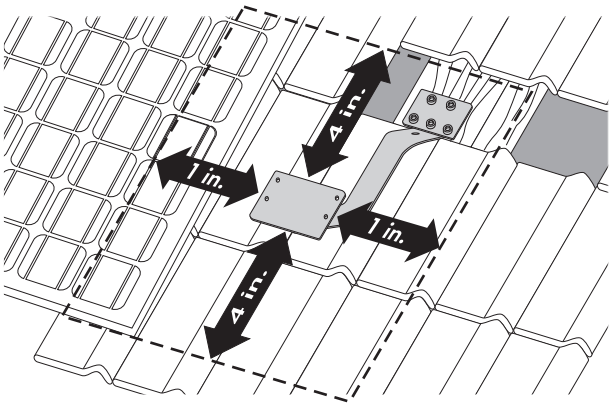
SMA order number: Roofann-Ssensor



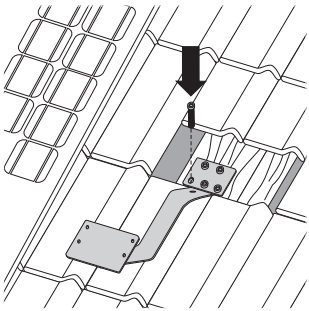
A	1	Roof bracket
B	5	Hexagonal wood screws
C	5	Washers

For mounting on a rafter you require the optional roof bracket (see section 13 "Accessories" (page 59)).

1. Determine the installation location considering the installation space and the orientation specified for the Sunny SensorBox (see page 18).

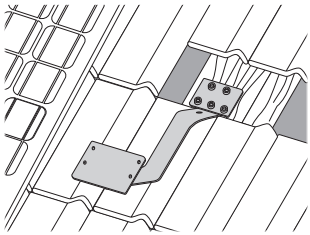


2. Remove the roof tiles in the installation area in order to uncover the rafter.
3. Attach the roof bracket to the rafter by using the 5 screws and the washers.



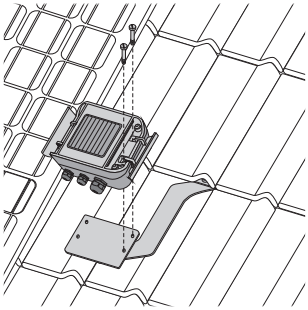
4. Integrate the Sunny SensorBox into the existing lightning protection.

   The possibility for attaching the lightning protection is located near the roof bracket on the lower slope.
5. Tilt the two flaps on the right and left side on the Sunny SensorBox towards the side (see also section 10.1 "Opening the Sunny SensorBox" (page 51)).



6. Attach the Sunny SensorBox to the roof bracket using the 4 screws. Observe the orientation of the Sunny SensorBox (see page 18).
7. Screw the 4 screws in a clockwise direction.
8. Put the roof tiles back on the roof.
9. Make the connections to the Sunny SensorBox (see section 5 "Electrical Connection" (page 26)).

☑ The Sunny SensorBox is mounted on the rafter.

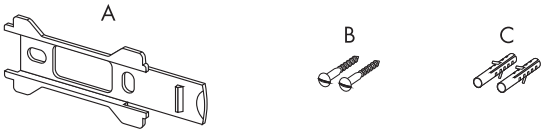


4.3 Mounting the RS485-Power Injector

The RS485-Power Injector is mounted onto the wall with the aid of the wall mounting bracket.

4.3.1 Wall Mounting

Mounting accessories provided



A	1	Wall mounting bracket
B	2	Screws
C	2	Screw anchor

Mounting the RS485-Power Injector

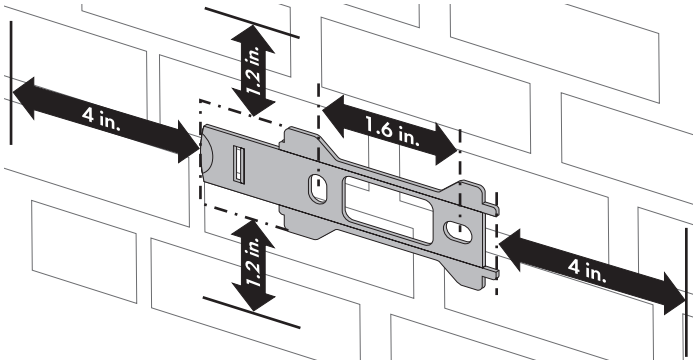
DANGER!

Risk of electric shock when drilling into power cables.

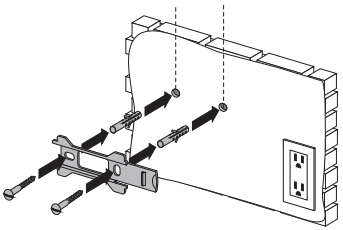
Death or serious injury.

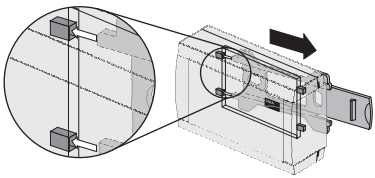
- Check installation location for power cables.

1. Determine the installation location upon consideration of the installation space.

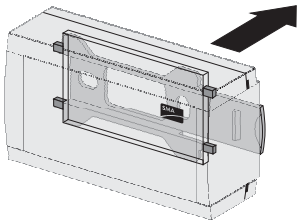


2. Position the wall mounting bracket on the mounting location and mark the positions of the drill holes.
3. Drill holes (diameter: 15/64") at the marked points and insert the screw anchors.
4. Attach the wall mounting bracket to the wall using the two screws provided.
5. Turn the screws in a clockwise direction and tighten.
6. Slide the RS485-Power Injector onto the wall mounting bracket from the left hand side.



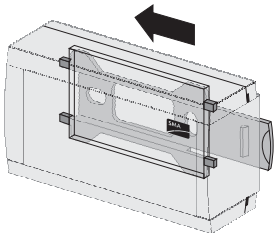


7. Press the RS485-Power Injector to the wall.



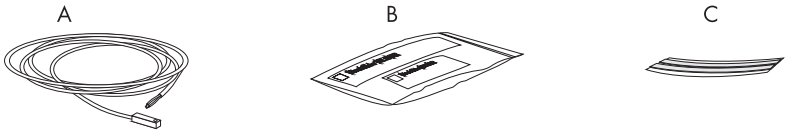
8. Slide the RS485-Power Injector to the left.

☑ You have successfully mounted the RS485-Power Injector on the wall.



4.4 Mounting the Module Temperature Sensor

Mounting accessories provided



A	1	PT100 module temperature sensor with 8.2 ft. connection cable
B	1	Thermally conductive adhesive (protective gloves, hardener and binder) with instructions and packaging
C	2	Adhesive tape strips

The module temperature sensor is also separately available, see section 13 "Accessories" (page 59).

CAUTION!

Risk of chemical burns due to contact with thermally conductive adhesive.

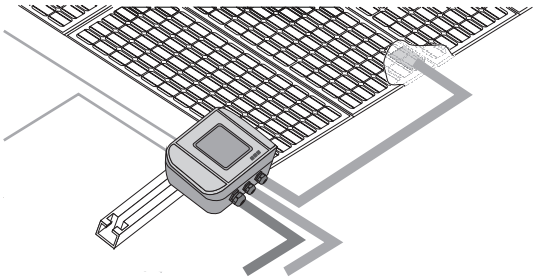
Chemical burns of skin, mucous membranes and eyes.

- Follow the safety precautions and instruction of thermally conductive adhesive manufacturer.

Thermally conductive adhesive

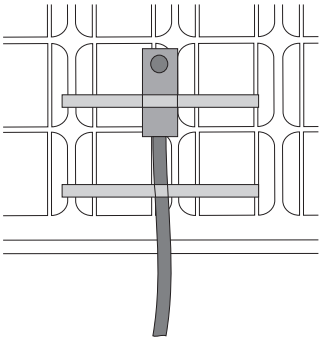
Mix the thermally conductive adhesive according to the manufacturer's instructions. When processing, follow the processing and curing times specified by manufacturer.

1. Determine the installation location taking into account the sensor's cable length.



2. Prepare the thermally conductive adhesive according to the manufacturer's instructions.
3. Position the module temperature sensor under a solar cell. The round cutout points towards the solar cell.
4. Stick the module temperature sensor using the thermally conductive adhesive provided.
5. Fix the module temperature sensor and the cable to the bottom side of the solar cell using adhesive tape strips.
6. After the thermally conductive adhesive has been cured, the adhesive tape strips can be removed.

☑ The module temperature sensor is mounted.



5 Electrical Connection

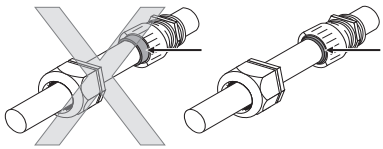
The connection of the Sunny SensorBox to the RS485 communication bus and the connection of the module temperature sensor is described below.

NOTICE!

Ingress of water when mounting and installing the Sunny SensorBox.

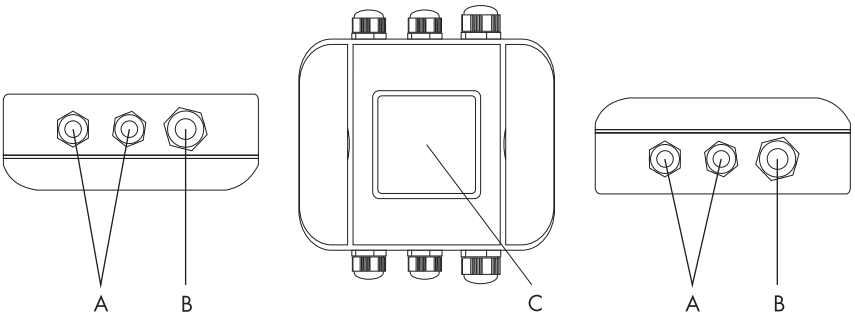
Damage to the Sunny Sensor Box.

- When working outdoors, make sure that no liquids (e. g. rain or snow) enter the open Sunny SensorBox.
- When inserting and removing the cable through the cable gland, make sure that the grommet correctly fits into the cable gland.

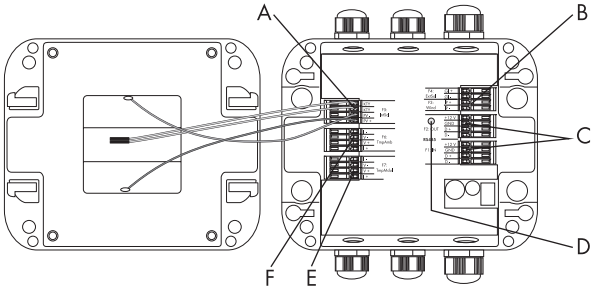


5.1 Overview of the Connection Area

5.1.1 Sunny SensorBox

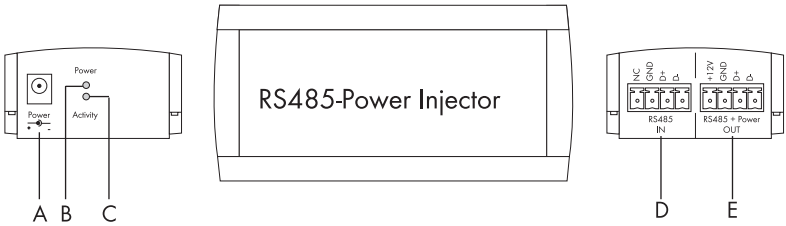


A Cable opening for sensors
B Cable opening for the RS485 communication bus
C Integrated irradiation sensor



A Connection terminal for the integrated irradiation sensor
B Connection terminal for the anemometer
C Terminal for the RS485 communication cable
D LED for RS485 communication
E Connection terminal for the module temperature sensor
F Connection terminal for the ambient temperature sensor

5.1.2 RS485-Power Injector



A Connection for the plug-power supply

B Power-LED displays if the device is supplied with voltage

C Activity-LED displays the interchange of data on the RS485 communication cable

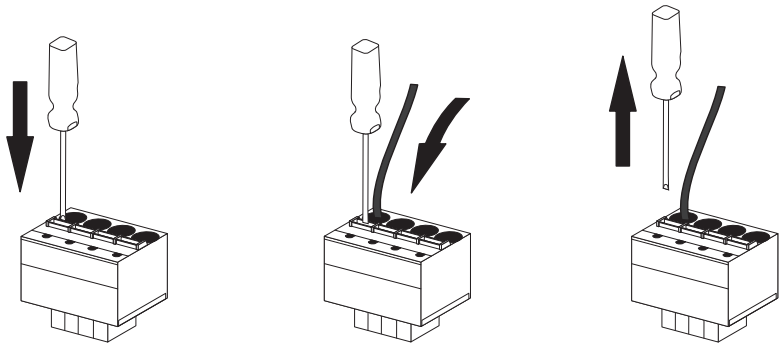
D RS485 IN: Connection for the RS485 bus

E RS485 + Power OUT: Connection for the RS485 bus

5.2 Operation of the clamps

5.2.1 Operating the Plug of the RS485-Power Injector

This section describes how to connect the insulated conductors of the communication cable to the terminals of the plugs.

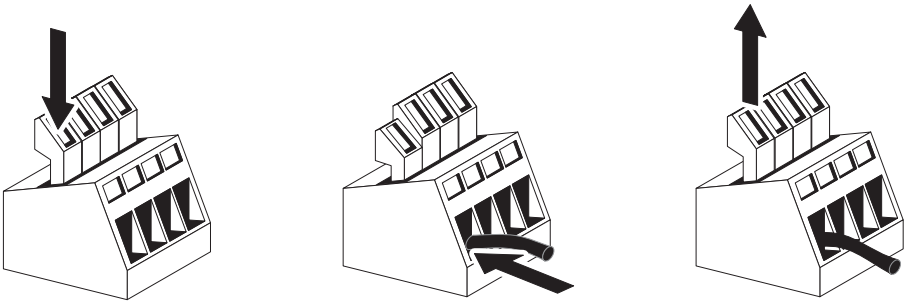


1. Press the orange surface with your finger nail or a screwdriver into the plug and keep it pressed.
2. Insert the insulated conductor into the terminal.
3. Remove finger nail or screwdriver.
4. Pull the insulated conductor to check that it is securely in place.
5. Connect all insulated conductors required as described in points 1 to 4.

☑ The insulated conductors are connected to the RS485-Power Injector

5.2.2 Operating the Terminals in the Sunny SensorBox

This section describes how to connect the insulated conductors to the terminals in the Sunny SensorBox.

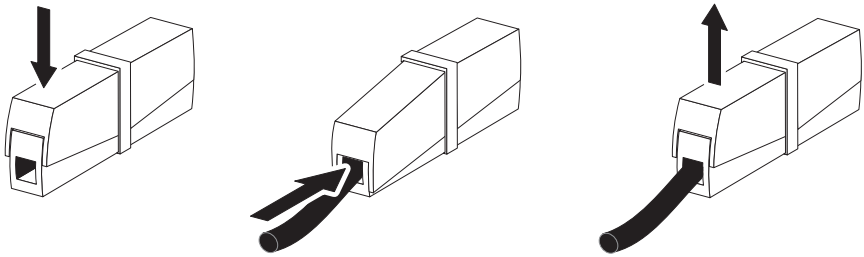


1. Press the white lever with your finger nail or a screwdriver downwards and keep it pressed.
2. Insert the insulated conductor into the terminal.
3. Remove finger nail or screwdriver.
4. Pull the insulated conductor to check that it is securely in place.
5. Connect all insulated conductors required as described in points 1 to 4.

☑ The insulated conductors are connected to the terminals in the Sunny SensorBox.

5.2.3 Operating the Connection Terminal for Cable Shield

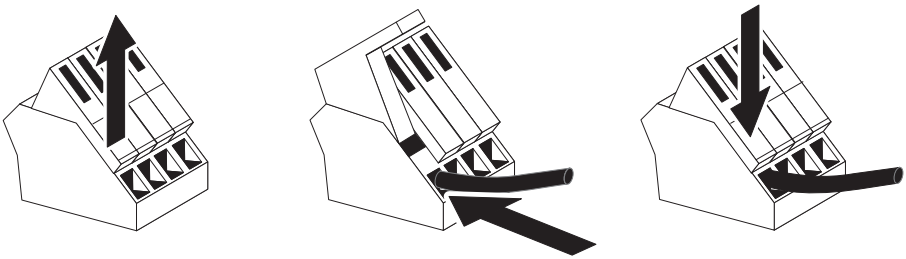
This section describes how to connect the cable shield to the connection terminal.



1. Pinch the connection terminal provided on one side together.
2. Plug the stand-alone shield into the connection terminal.
3. Release the connection terminal.
4. Pull the shield to check that it is securely in place.

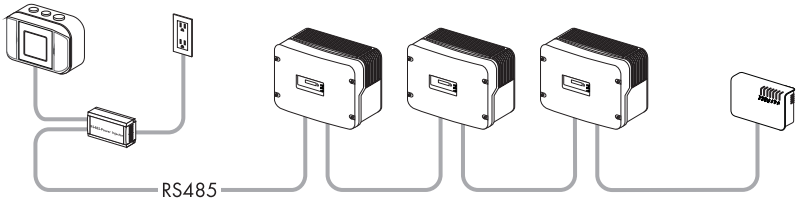
☑ The shield is connected to the connection terminal.

5.2.4 Operating the Terminals for the Sensors



1. Press the black levers at the terminal upwards until it locks into place.
2. Insert the insulated conductors into the terminal or remove resistors/wire bridge.
3. Press the black levers downwards.
4. Pull the insulated conductor to check that it is securely in place.

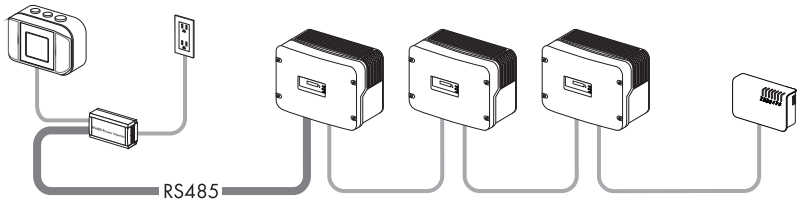
5.3 Connecting the Sunny SensorBox to the RS485 Communication Bus



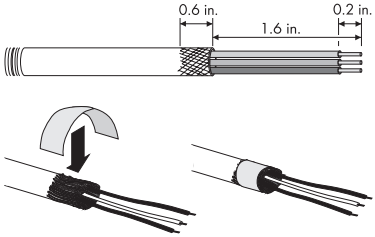
The Sunny SensorBox is integrated into the RS485 communication bus via the RS485-Power Injector. The RS485-Power Injector supplies the Sunny SensorBox with voltage. Note that the Sunny SensorBox should be positioned at the end of the RS485 communication bus. The required termination has already been pre-wired. The termination is describe in section 5.3.5 "Terminating the RS485 Bus" (page 42).

5.3.1 Connecting the RS485-Power Injector to the RS485 Bus Subscribers

The section describes how to connect the communication cable of an RS485 bus subscriber (for example inverter) to the RS485 IN socket of the RS485-Power Injector.



1. Connect the cable to the RS485 bus subscriber (for example inverter).
2. Remove 1.6 in. of cable sheath at the RS485-Power Injector end of the RS485 communication cable.
3. Shorten the shield to 0.6 in.
4. Pull back the shield and cover with conductive adhesive foil. This is where the shield clamp will be attached later.
5. 3 insulated conductors are required for the connection to the RS485-Power Injector. Observe the configurations of the insulated conductors in the RS485 communication bus. Shorten the fourth insulated conductor not required down to the cable sleeve.
6. Strip approx. 0.2 in. off the insulated conductors.



Connection layout and system wiring

See the RS485 cabling plan poster for the connection layout and system wiring.

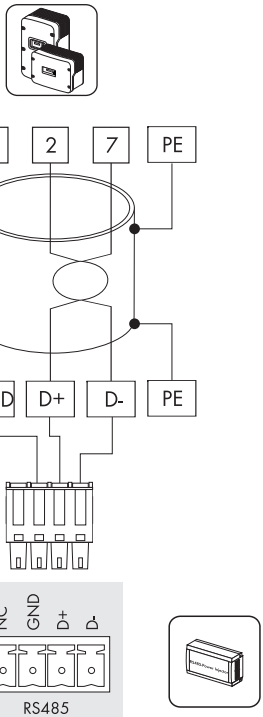
7. Connect the insulated conductors to the plug provided (see section 5.2.1 "Operating the Plug of the RS485-Power Injector" (page 28)). Observe the configurations of the insulated conductors in the RS485 communication bus.

   If necessary, write down the color of the insulated conductors of the RS485 communication bus.

   2 | D+ _____

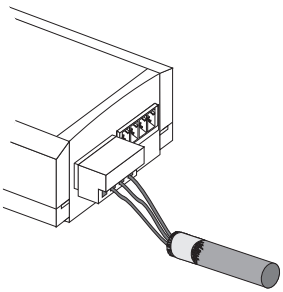
   5 | GND _____

   7 | D- _____



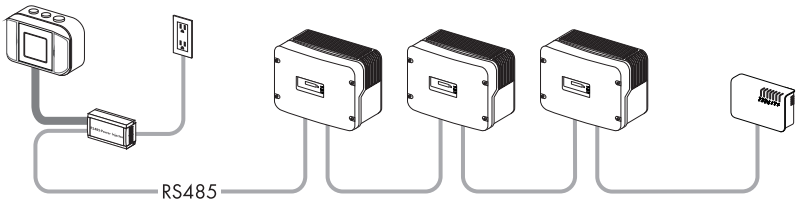
8. Plug the plug into the RS485-Power Injector socket (RS485 IN).

☑ The RS485-Power Injector is connected to the RS485 communication bus.



5.3.2 Connecting the RS485-Power Injector to the Sunny SensorBox

This section describes how to connect the communication cable of the Sunny Sensor Box to the RS485 OUT socket of the RS485-Power Injector.



Connecting the communication cable to the RS485-Power Injector

1. Remove 1.6 in. of cable sheath at the RS485-Power Injector end of the RS485 communication cable.
2. Shorten the shield to 0.6 in.
3. Pull back the shield and cover with conductive adhesive foil. This is where the shield clamp will be attached later.
4. Shorten the insulated conductors not required down to the cable sleeve.
5. Strip approx. 0.2 in. off the insulated conductors.
6. Connect the insulated conductors to the plug (see section 5.2.1 "Operating the Plug of the RS485-Power Injector" (page 28)).

   Write down the color of the insulated conductors:

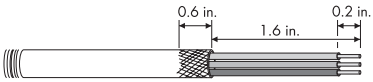
   +12V _____

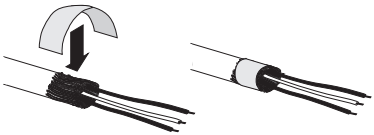
   GND _____

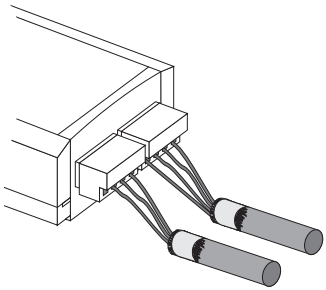
   D+ _____

   D - _____
7. Plug the plug into the RS485-Power Injector socket (RS485+Power OUT).

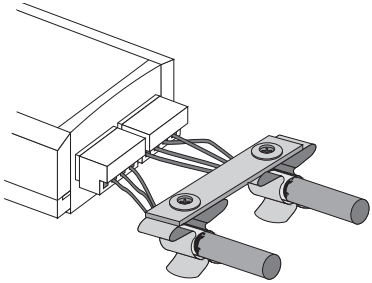
   ☑ The RS485-Power Injector is connected





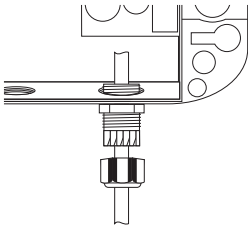


8. Push the two communication cables connected to the RS485-Power Injector into the clips of the shield clamp. The clips of the shield clamp must be positioned on the conductive adhesive foil.
9. Lay a cable from the RS485-Power Injector to the Sunny SensorBox.



Connecting the communication cable to the Sunny SensorBox

10. Open the Sunny SensorBox as described in section 10.1 "Opening the Sunny SensorBox" (page 51).
11. Unscrew the cable gland's lock nut on the right at the bottom of the Sunny SensorBox in a counterclockwise direction and remove the filler plugs.
12. Thread the cable through the lock nut and the cable gland into the Sunny SensorBox enclosure.
13. Loosely turn the lock nut in a clockwise direction onto the cable gland during further work.



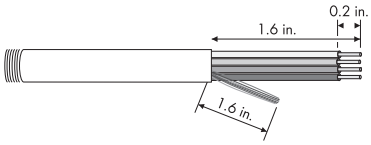
NOTICE!

Risk of short circuit due to metal or cable scraps falling into the Sunny SensorBox during installation.

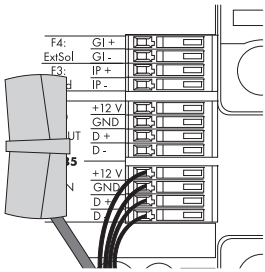
Possible damage of the electronics of the Sunny SensorBox.

- When working on the cable, make sure that no metal scraps of the shield or the cable fall into the open Sunny SensorBox.
- Remove any metal or cable scraps, if required.

14. Remove 1.6 in cable sleeve of the RS485 communication cable on the Sunny SensorBox.
15. Strip approx. 0.2 in. off the insulated conductors.
16. Twist the shield to one string. The shield is only required, if another Sunny SensorBox is connected.
17. Pull the insulating tube provided over the shield. Allow 0.4 in. of the shield to protrude out of the insulating tube.

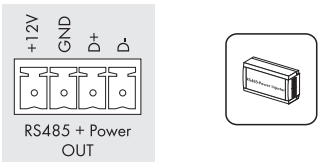


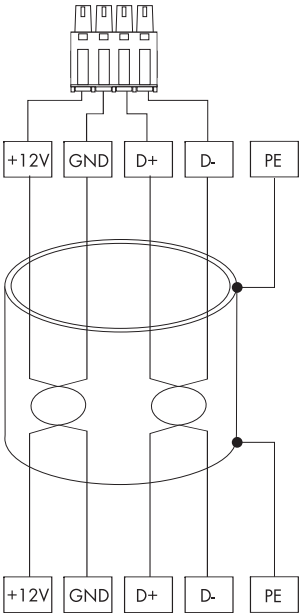
18. Insert the stand-alone shield into the connection terminal as described in section 5.2.3 "Operating the Connection Terminal for Cable Shield" (page 29).

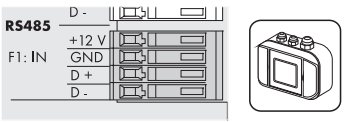


19. Connect the insulated conductors to the terminals RS485 F1: IN of the Sunny SensorBox (see section 5.2.2 "Operating the Terminals in the Sunny SensorBox" (page 29)). Note the colors of the insulated conductors listed under point 6.
20. Ensure that the grommet of the cable gland is correctly in place.
21. Screw the lock nut hand-tight onto the cable gland in a clockwise direction, in order to fix the cable (torque: 7 in-lbs).
22. If you wish to connect another SensorBox, refer to section 5.3.3 "Connecting the Sunny SensorBox to an additional Sunny SensorBox" (page 36).
23. If the Sunny SensorBox is situated in the middle of the RS485 communication bus, refer to section 5.3.4 "Connecting the Sunny SensorBox to an Additional RS485 Bus Subscriber" (page 40).
24. If you wish to connect the module temperature sensor, refer to section 5.4 "Connecting the Module Temperature Sensor" (page 42).
25. Connect additional sensors to the Sunny SensorBox.
26. Check termination, see section 5.3.5 "Terminating the RS485 Bus" (page 42).
27. Close the Sunny SensorBox as described in section 10.2 "Closing the Sunny SensorBox" (page 52).

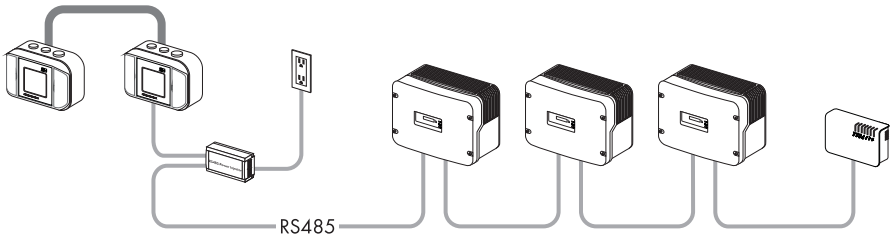
☑ The RS485-Power Injector is connected to the Sunny SensorBox.







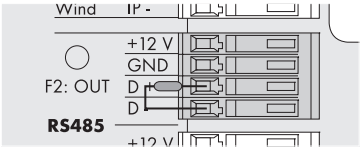
5.3.3 Connecting the Sunny SensorBox to an additional Sunny SensorBox



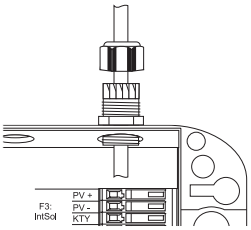
You can add another SensorBox to the Sunny SensorBox. In doing this, you can use the RS485-Power Injector for the additional Sunny SensorBox units (up to a maximum of 5 Sunny SensorBox units).

Connection to existing Sunny SensorBox devices

1. Open the Sunny SensorBox as described in section 10.1 "Opening the Sunny SensorBox" (page 51).
2. Remove the termination resistor at F2:OUT RS485 on the existing Sunny SensorBox. How to operate the terminal is described in section 5.2.2 "Operating the Terminals in the Sunny SensorBox" (page 29).



3. Unscrew the cable gland's lock nut on the right at the top of the existing Sunny SensorBox in a counterclockwise direction and remove the filler plugs.
4. Thread the new cable through the lock nut and the cable gland into the enclosure of the existing Sunny SensorBox.
5. Loosely turn the lock nut in a clockwise direction onto the cable gland during further work.



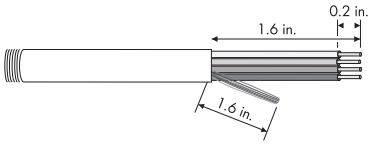
NOTICE!

Risk of short circuit due to metal or cable scraps falling into the Sunny SensorBox during installation.

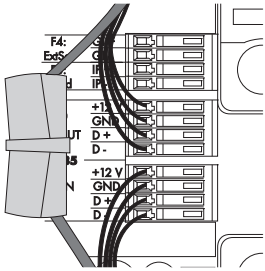
Possible damage of the electronics of the Sunny SensorBox.

- When working on the cable, make sure that no metal scraps of the shield or the cable fall into the open Sunny SensorBox.
- Remove any metal or cable scraps, if required.

6. Remove 1.6 in. of cable sheath of the RS485 communication cable at the existing Sunny SensorBox.



7. Strip approx. 0.2 in. off the insulated conductors.
8. Twist the shield to one string.
9. Pull the insulating tube provided over the shield. Allow 0.4 in. of the shield to protrude out of the insulating tube.
10. Insert the stand-alone shield into the connection terminal as described in section 5.2.3 "Operating the Connection Terminal for Cable Shield" (page 29).



11. Connect the insulated conductors to the terminals F2: OUT RS485 of the existing Sunny SensorBox. How to operate the terminal is described in section 5.2.2 "Operating the Terminals in the Sunny SensorBox" (page 29).

    Write down the color of the insulated conductors:

    +12V _____

    GND _____

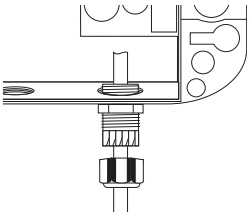
    D+ _____

    D- _____
12. Ensure that the grommet of the cable gland is correctly in place.
13. Screw the lock nut hand-tight onto the cable gland in a clockwise direction, in order to fix the cable (torque: 7 in-lbs).
14. Close the Sunny SensorBox as described in section 10.2 "Closing the Sunny SensorBox" (page 52).

    ☑ The cable is connected to the Sunny SensorBox.

Connection to the Sunny SensorBox to be connected

15. Install the Sunny SensorBox to be connected as described in section 4.2 "Mounting the Sunny SensorBox" (page 18).
16. Open the Sunny SensorBox to be connected as described in section 10.1 "Opening the Sunny SensorBox" (page 51).
17. Unscrew the cable gland's lock nut on the right at the bottom of the Sunny SensorBox to be connected in a counterclockwise direction and remove the filler plugs.
18. Thread the cable through the lock nut and the cable gland into the Sunny SensorBox enclosure.
19. Loosely turn the lock nut in a clockwise direction onto the cable gland during further work.



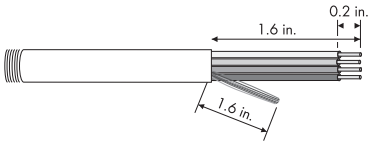
NOTICE!

Risk of short circuit due to metal or cable scraps falling into the Sunny SensorBox during installation.

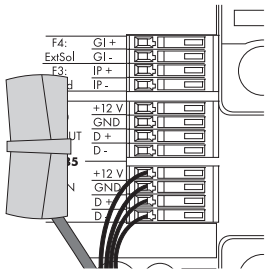
Possible damage of the electronics of the Sunny SensorBox.

- When working on the cable, make sure that no metal scraps of the shield or the cable fall into the open Sunny SensorBox.
- Remove any metal or cable scraps, if required.

20. Remove 1.6 in. cable sleeve of the RS485 communication cable on the Sunny SensorBox.
21. Strip approx. 0.2 in. off the insulated conductors.
22. Twist the shield to one string. The shield is only required, if another Sunny SensorBox is connected.

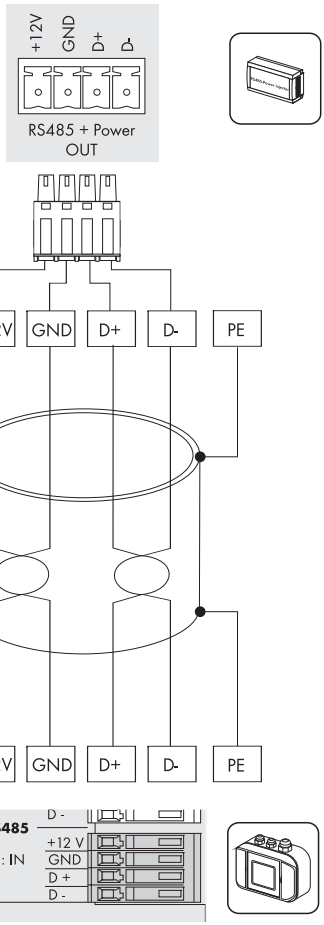


23. Pull the insulating tube provided over the shield. Allow 0.4 in. of the shield to protrude out of the insulating tube.
24. Insert the stand-alone shield into the connection terminal as described in section 5.2.3 "Operating the Connection Terminal for Cable Shield" (page 29).

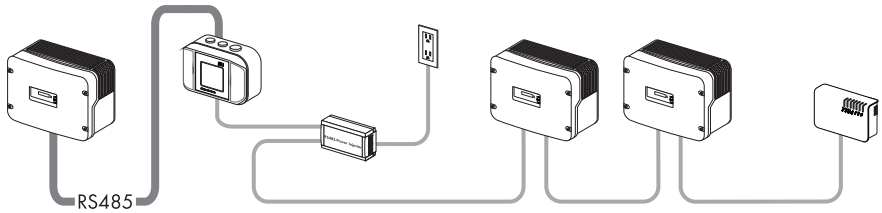


25. Connect the cables to the terminals F1: IN RS485 of the Sunny SensorBox. Note the colors of the insulated conductors indicated under point 14 How to operate the terminal is described in section 5.2.2 "Operating the Terminals in the Sunny SensorBox" (page 29).
26. Ensure that the grommet of the cable gland is correctly in place.
27. Screw the lock nut hand-tight onto the cable gland in a clockwise direction, in order to fix the cable (torque: 7 in-lbs).
28. If you wish to connect another SensorBox, refer to section 5.3.3 "Connecting the Sunny SensorBox to an additional Sunny SensorBox" (page 36).
29. If the Sunny SensorBox is situated in the middle of the RS485 communication bus, refer to section 5.3.4 "Connecting the Sunny SensorBox to an Additional RS485 Bus Subscriber" (page 40).
30. If you wish to connect the module temperature sensor, refer to section 5.4 "Connecting the Module Temperature Sensor" (page 42).
31. Connect additional sensors to the Sunny SensorBox.
32. Check termination, see section 5.3.5 "Terminating the RS485 Bus" (page 42).
33. It is required to make connections at the pre-installed cable gland, in order to prevent any water or moisture from entering the device.
34. Close the Sunny SensorBox as described in section 10.2 "Closing the Sunny SensorBox" (page 52).

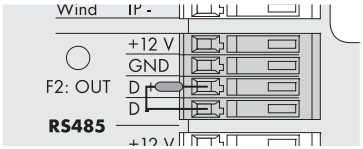
☑ The additional Sunny SensorBox is connected.



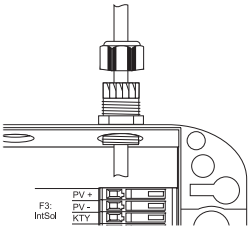
5.3.4 Connecting the Sunny SensorBox to an Additional RS485 Bus Subscriber



1. Open the Sunny SensorBox as described in section 10.1 "Opening the Sunny SensorBox" (page 51).
2. Remove the termination resistor at F2:OUT RS485 on the Sunny SensorBox. How to operate the terminal is described in section 5.2.2 "Operating the Terminals in the Sunny SensorBox" (page 29).



3. Unscrew the cable gland's lock nut on the right at the top of the Sunny SensorBox in a counterclockwise direction and remove the filler plugs.
4. Thread the cable through the lock nut and the cable gland into the Sunny SensorBox enclosure.
5. Loosely turn the lock nut in a clockwise direction onto the cable gland during further work.



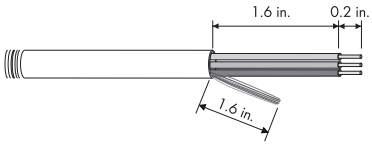
NOTICE!

Risk of short circuit due to metal or cable scraps falling into the Sunny SensorBox during installation.

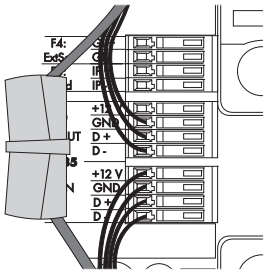
Possible damage of the electronics of the Sunny SensorBox.

- When working on the cable, make sure that no metal scraps of the shield or the cable fall into the open Sunny SensorBox.
- Remove any metal or cable scraps, if required.

6. Remove 1.6 in. of cable sleeve of the RS485 communication cable on the Sunny SensorBox.
7. Strip approx. 0.2 in. off the insulated conductors.
8. Twist the shield to one string.
9. Pull the insulating tube provided over the shield.
   Allow 1 in. of the shield to protrude out of the insulating tube



10. Insert the stand-alone shield into the connection terminal as described in section5.2.3 "Operating the Connection Terminal for Cable Shield" (page 29).



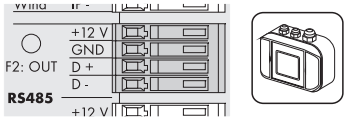
11. Connect the insulated conductors to the terminals F2: OUT RS485 of the Sunny SensorBox. How to operate the terminal is described in section 5.2.2 "Operating the Terminals in the Sunny SensorBox" (page 29). Observe the configurations in your RS485 communication bus.

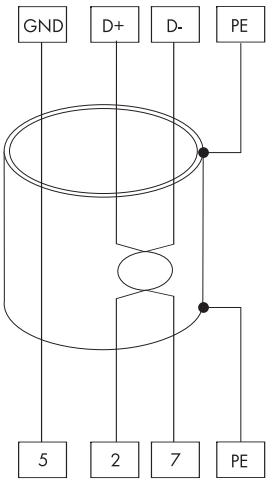
    Write down the color of the insulated conductors:

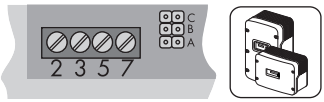
    GND | 5 _____

    D+| 2 _____

    D- | 7 _____







12. Ensure that the grommet of the cable gland is correctly in place.
13. Screw the lock nut hand-tight onto the cable gland in a clockwise direction, in order to fix the cable (torque:7 in-lbs).
14. Close the Sunny SensorBox as described in section 10.2 "Closing the Sunny SensorBox" (page 52).

☑ The SensorBox is connected to an RS485 bus subscriber.

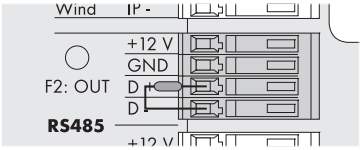
5.3.5 Terminating the RS485 Bus

Termination of the RS485 communication bus

Refer to the RS485 cabling plan poster for the termination of an RS485 communication bus.

Connect the termination only if the Sunny SensorBox is positioned at the end of the RS485 communication bus. Termination is realized via a termination resistor. The termination resistor is mounted upon delivery.

1. Connect the resistor to the D+ and D- terminals for a termination on the RS485 F2:OUT connection. How to operate the terminal is described in section 5.2.2 "Operating the Terminals in the Sunny SensorBox" (page 29).



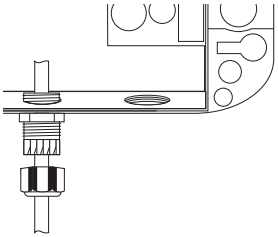
☑ The Sunny SensorBox is terminated.

5.4 Connecting the Module Temperature Sensor

Cable length when connecting in a 2-conductor technology

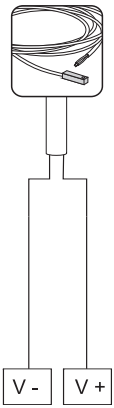
The connection is made via a cable with a length of 8.2 ft. The cable may not be extended or cut. The measurement accuracy depends on the cable length.

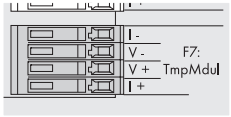
1. Open the Sunny SensorBox as described in section 10.1 "Opening the Sunny SensorBox" (page 51).
2. Unscrew the cable gland's lock nut on the bottom left of the Sunny SensorBox in a counterclockwise direction and remove the filler plugs.
3. Thread the sensor cable through the lock nut and the cable gland at the bottom left into the Sunny SensorBox enclosure.



4. Connect the sensor to the "F7: TmpMdul" terminal of the Sunny SensorBox as described in section 5.2.4 "Operating the Terminals for the Sensors" (page 30).
5. Ensure that the grommet of the cable gland is correctly in place.
6. Screw the lock nut hand-tight onto the cable gland in a clockwise direction, in order to fix the cable (torque: 7 in-lbs).
7. Securely lay the cable using suitable fastening material.
8. Close the Sunny SensorBox as described in section 10.2 "Closing the Sunny SensorBox" (page 52).

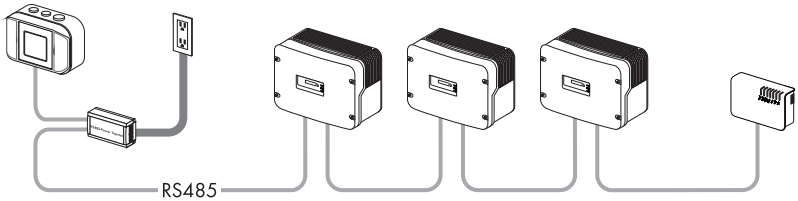
☑ The module temperature sensor is connected.





6 Commissioning

6.1 Connecting the RS485-Power Injector to the Power Supply



Connect the RS485-Power Injector to the power supply only after all cabling has been completed. The Sunny SensorBox starts up once it is connected to the power supply and is ready for use after about 1 minute.

1. Connect the DC plug connector of the power supply unit to the DC connection of the RS485-Power Injector.
2. The power supply adapter is included in the delivery. Choose the correct adapter for your socket.
3. Place the adapter on the power supply and push down. The plug audibly snaps into place.
4. Check that the adapter is securely in place.
5. Plug the power supply into a socket.
6. Securely lay the cable using suitable fastening material.
7. Commission the inverter as described in its installation guide.
8. Commission the communication device as describe in the communication device manual.

☑ The RS485-Power Injector is connected to the power supply.

You can visualize the data from your Sunny SensorBox's sensors in the Sunny Portal (www.SunnyPortal.com). For the sensors, you can have Sunny Portal automatically generate the standard pages for performance ratio and standardized system yield. For further information refer to the Sunny Portal user manual.

7 Maintenance and Care

7.1 Maintenance

Conduct regular visual inspections of the Sunny SensorBox and the RS485-Power Injector to check for external damage or dirt.

For the solar cell integrated in the Sunny SensorBox and the sensors, dirt (e. g. leaves, bird droppings) can lead to wrong measuring results. Clean the device.

If functionality or safety is impaired by damage, have a qualified personnel replace the damaged device, sensor or cable.

The rubber seal in the Sunny SensorBox lid becomes porous over the course of time, and will no longer provide a tight seal if the Sunny SensorBox is then opened. In case you will open the Sunny SensorBox after an operating lifetime of more than 5 years, e. g. for upgrading the device, the rubber seal in the Sunny SensorBox lid must therefore be replaced with a new one. In this case, order a replacement seal before starting maintenance works (see section 13.3 "Seals of the Sunny SensorBox" (page 59)).

7.2 Care

To clean the Sunny SensorBox and the RS485-Power Injector, use a soft, damp cloth. Make sure that the cloth is made of scratch-free material so that the surface of the enclosure will not be damaged. If there is a considerable amount of dirt, you can also use a mild, non-abrasive and non-corrosive cleaning agent.

8 Decommissioning

8.1 Removing the Sunny SensorBox

1. Pull the RS485-Power Injector's plug-in power supply out of the socket.
2. Remove the Sunny SensorBox and RS485-Power Injector cables in the sequence opposite to that which is described in section 5.3.2 "Connecting the RS485-Power Injector to the Sunny SensorBox" (page 33).
3. Note the termination of your RS485 communication bus. In case the Sunny SensorBox was the last device in the RS485 communication bus, adjust the termination of the RS485 communication bus.
4. Disassemble the Sunny SensorBox in the sequence opposite to that of mounting as described in section 4.2 "Mounting the Sunny SensorBox" (page 18).

☑ The Sunny SensorBox has been disassembled.

8.2 Removing the RS485-Power Injector

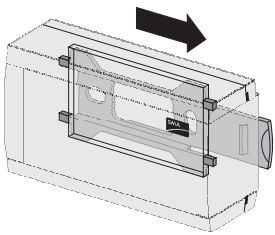
NOTICE!

Dismounting of the RS485-Power Injector from the wall mounting bracket due to careless pulling on the cable.

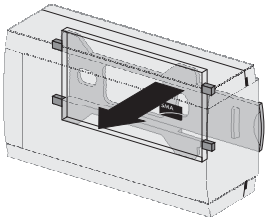
Damage to the wall mounting bracket.

- Hold the RS485-Power Injector tight whenever pulling out or plugging in the power cable or a plug.

1. Pull the plug-in power supply out of the socket.
2. Remove the DC plug connector of the power supply unit from the DC connection of the RS485-Power Injector.
3. Remove the RS485 cabling.
4. To unlock, push the wall mounting bracket towards the wall. The wall mounting bracket protrudes on the right side behind the RS485-Power Injector.
5. Slide the RS485-Power Injector to the right.

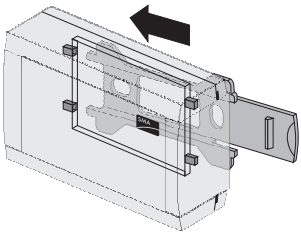


6. Pull the RS485-Power Injector on the right side forward.



7. Slide the RS485-Power Injector to the left of the wall mounting bracket.
8. Unscrew the wall mounting bracket from the wall.

☑ The RS485-Power Injector is now removed.



8.3 Removing the Sensors

When removing the ambient temperature sensor, the module temperature sensor or an irradiation sensor and the connections in the Sunny SensorBox, irregular values for these sensors are displayed in the Sunny WebBox.

- Remove the sensors' cables in the sequence opposite to the connection of the respective sensors.

8.4 Packaging the Sunny SensorBox and Sensors

For reshipment, use a transport-secure packaging - if possible the original packaging.

8.5 Disposing of the Sunny SensorBox and Sensors

Dispose of the Sunny SensorBox and the RS485-Power Injector at the end of their service life in accordance with the disposal regulations for electronic waste which apply at the installation site at that time. Alternatively, send them back to SMA America with shipping paid by the sender, and labeled"FOR DISPOSAL".

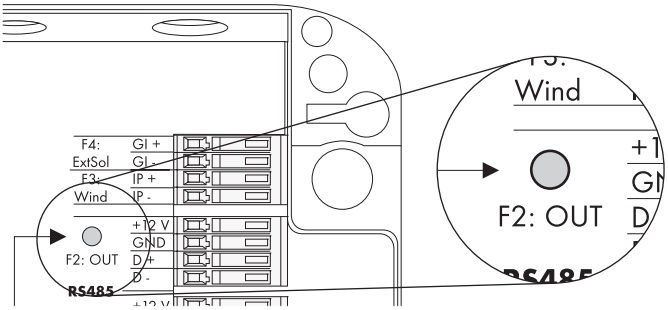
9 Troubleshooting

If the error cannot be found, call our Serviceline and have the information listed in section 14 "Contact" (page 73) available.

9.1 Sunny SensorBox

9.1.1 Meaning of the LED

The LED is situated in the Sunny SensorBox. Open the Sunny SensorBox as described in section 10.2 "Closing the Sunny SensorBox" (page 52).



LED Status/Color	Function
off	When you perform a reset, the LED remains off for 60 seconds. If you are not performing a reset, and the LED remains off for more than 10 seconds (required startup time), the Sunny SensorBox is not being supplied with power. • Check whether the RS485-Power Injector's power plug is plugged in. • Check the connection from the RS485-Power Injector to the Sunny SensorBox as described in section 5.3.2 "Connecting the RS485-Power Injector to the Sunny SensorBox" (page 33).
glows yellow	The Sunny SensorBox is connected to the power supply, and is ready for operation.
blinks yellow 2 x very quickly	The Sunny SensorBox is connected to the power supply, and is at present receiving data from the communication device via the RS485 bus.

LED Status/Color	Function
blinks yellow at intervals of one second	An error has occurred in the firmware. Ask your installer to perform a firmware update.

9.2 Ambient Temperature Sensor

In the channel "TmpAmb C", depending on the selected unit, one of the following values is permanently displayed: -273.15°C, 0K, -459.67°F:

- No sensor is connected.
- Connection fault in the Sunny SensorBox.

  I+/V- or I-/V+ were interchanged during connection. Check the connection as described in section 13.4.5 "Connecting the Ambient Temperature Sensor to the Sunny SensorBox" (page 64).

Unrealistic values are displayed:

- Check whether the sensor is connected to the correct terminal as described in section 13.4.5 "Connecting the Ambient Temperature Sensor to the Sunny SensorBox" (page 64).
- Check the cable for external damage.
- Check the sensor for external damage or dirt.
- The sensor has been deactivated, and the resistor is no longer plugged into the Sunny SensorBox.

9.3 Anemometer

Unrealistic values are displayed:

- Check whether the anemometer is connected to the correct terminal as described in section 13.5.5 "Connecting the Anemometer to the Sunny SensorBox" (page 71). Interchanging the insulated conductors at the "F3: Wind" terminal does not affect the functionality.
- Check the cable for external damage.
- Check the sensor for external damage or dirt.

9.4 Integrated Irradiation Sensor

Unrealistic values are displayed:

- Check whether the integrated irradiation sensor is correctly connected as described in section 9.4.1 "Connection of the Integrated Irradiation Sensor" (page 50).
- Check the cable for external damage.
- Check the sensor for external damage or dirt.
- The sensor has been deactivated, and the resistor is no longer plugged into the Sunny SensorBox.

9.4.1 Connection of the Integrated Irradiation Sensor

Upon delivery, the integrated irradiation sensor in the cover of the Sunny SensorBox is already pre-connected. If you have decommissioned the integrated irradiation sensor, you can reconnect it as described here.

1. Pull the RS485-Power Injector's plug-in power supply out of the socket.
2. Open the Sunny SensorBox as described in section 10.1 "Opening the Sunny SensorBox" (page 51).
3. Connect the sensor to the "F5: IntSol" terminal of the Sunny SensorBox as described in section 5.2.4 "Operating the Terminals for the Sensors" (page 30).

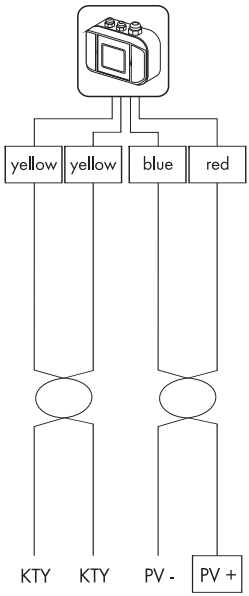
   KTY yellow insulated conductor

   KTY yellow insulated conductor

   PV- blue insulated conductor

   PV+ red insulated conductor

☑ The integrated irradiation sensor is connected to the Sunny SensorBox.



10 Opening and Closing the Sunny SensorBox

NOTICE!

Ingress of water into the opened Sunny SensorBox.

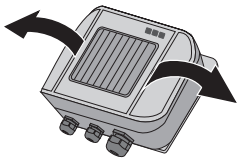
Damage to the Sunny SensorBox.

- When working outdoors, make sure that no liquids (e. g. rain or snow) enter the open Sunny SensorBox.

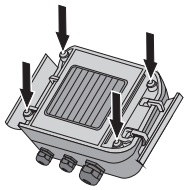
10.1 Opening the Sunny SensorBox

1. Pull the RS485-Power Injector's plug-in power supply out of the socket.
2. Flip the two flaps on the right and left side of the Sunny SensorBox aside. Use the cutouts on the flaps to do so.

   ☑ The flaps are opened.

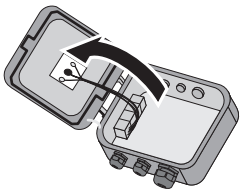


3. Loosen the 4 screws on top and bottom in the corners of the Sunny SensorBox in a counterclockwise direction. The screws cannot be removed.



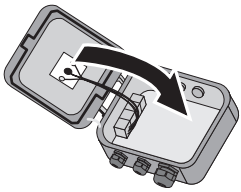
4. Open the enclosure lid up towards the left. The cover is connected to the lower shell by hooks.

☑ The Sunny SensorBox is opened.

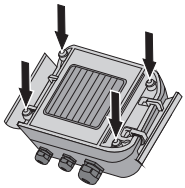


10.2 Closing the Sunny SensorBox

1. Close the Sunny SensorBox enclosure lid towards the right and place it on the lower enclosure shell.

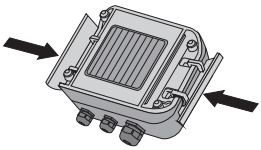


2. Initially turn the 4 screws on top and bottom in the corners of the Sunny SensorBox a little to the left, until the screws fall into the first turn of the thread.
3. Turn the 4 screws hand-tight (torque: 9 in-lbs) in a clockwise direction into the lower enclosure shell.



4. Press the two flaps on the right and left side of the Sunny SensorBox towards the Sunny SensorBox. The flaps audibly lock into place.

☑ The Sunny SensorBox is closed.



11 Channel List

The channel list is divided up into values and parameters. Values, such as the serial number (SN) for example, are read-only. You can make parameter settings, such as changing the temperature unit (TmpUnit).

11.1 General Parameters

Channel	Explanation	Value	Parameter
SN	Here, the serial number of the Sunny SensorBox is displayed.	x	
FwVer	Here, the firmware version of the Sunny SensorBox is displayed.	x	
HwVer	Here, the hardware version of the Sunny SensorBox is displayed.	x	
SMA-h-On	Here, the number of operating hours the Sunny SensorBox has been operating since its commissioning is displayed.	x	
TmpUnit	This allows you to select the unit in which the temperature is to be displayed. You can select one of the following units: • °C (factory setting) • K • °F		x
WindUnit	This allows you to select the unit in which the wind speed is to be displayed. You can select one of the following units: • m/s (factory setting) • km/h • mph		x
DevRs	Using this channel, you can reset the Sunny SensorBox. The value of this channel is always "0". If you wish to reset the Sunny SensorBox, enter the value "1", and save it. The Sunny SensorBox then resets, but the alteration to the channel's setting is not applied. The LED in the Sunny SensorBox then remains off for 60 seconds.		x
RS485DI	Response delay of the Sunny SensorBox to the RS485 bus. This channel must be set to "200ms" if you are using a Sunny Boy Control/ Plus or Sunny Central Control as communication device. Factory setting is 200 ms. When operating the Sunny SensorBox with a Sunny WebBox, the response delay can be reduced to 10ms. This channel is only visible if you are logged in at the communication device as "installer". Refer to your communication device's user manual.		x

11.2 Internal Solar Irradiation Sensor

Channel	Explanation	Value	Parameter
IntSolIrr	Here, the current solar irradiation level is displayed in W/m².	x	

11.3 Module Temperature Sensor

If no module temperature sensor is connected, absolute zero is displayed (-273.15°C, 0K, -459.67°F).

Channel	Explanation	Value	Parameter
TmpMdul C TmpMdul K TmpMdul F	Here, the current module temperature is displayed in the unit selected: • °C (degrees Celsius) • K (Kelvin) • °F (degrees Fahrenheit). The only channel ever visible is that of the selected unit. You can set the required unit using the general TmpUnit channel.	x	

11.4 Ambient Temperature Sensor

If no ambient temperature sensor is connected, absolute zero is displayed (-273,15 °C, 0 K, -459,67 °F).

Channel	Explanation	Value	Parameter
TmpAmb C TmpAmb K TmpAmb F	Here, the current ambient temperature is displayed in the unit selected: • °C (degrees Celsius) • K (Kelvin) • °F (degrees Fahrenheit). The only channel ever visible is that of the selected unit. You can set the required unit using the general TmpUnit channel.	x	

11.5 External Irradiation Sensors

An external irradiation sensor is currently not supported.

Channel	Explanation	Value	Parameter
ExtSolIrr	Here, the current solar irradiation level is displayed in W/m².	x	
ExtSolIrrCal	Here, you must set the voltage of the connected irradiation sensor in mV. Factory setting is "100mV".		x
ExtSolIrrFnc	Here, you must set the input range of the connected irradiation sensor. Factory setting is 0 mV to 300 mV.		x

11.6 Anemometer

If no anemometer is present, the value "0" is displayed in these channels.

Channel	Explanation	Value	Parameter
WindVel m/s WindVel km/h WindVel mph	Current wind speed in the selected unit. • m/s • km/h • mph The only channel ever visible is that of the selected unit. You can set the required unit using the general WindUnit channel.	x	

12 Technical Data

Sunny SensorBox

General data	
Dimensions (W/H/D) in inches	4.72/1.97/3.54
Weight	17.6 oz
Mounting location	outdoors
Applicability	Mounting plate, roof bracket
Connections	
Connections	integrated irradiation sensor, RS485, anemometer, module temperature sensor, ambient temperature sensor
Communication	
Data logger communication	RS485 to Sunny WebBox, RS485 to Sunny Boy Control and Sunny Central Control
Max. communication range	
RS485	4,000 ft.
Power supply	
Power supply via	RS485-Power Injector
Maximum number of Sunny SensorBox devices which can be operated with one RS485-Power Injector:	5
Power consumption	< 1 W
Measured values of the integrated irradiation sensor	
Solar cell type	amorphous
Accuracy	± 8 %
Measuring range	0 W/m² to 1500 W/m²
Resolution	1 W/m²
Environmental conditions during operation	
Ambient temperature	-13 °F to +158 °F
Relative humidity	5 % to 95 %, non-condensing
Warranty, Certificates and Permits	
Warranty	5 years
Certificates and permits	www.SMA-America.com

RS485-Power Injector

General data	
Dimensions (W/H/D) in inches	4.13/2.17/1.18
Weight	2.82 oz

Mounting location	indoors
Applicability	Wall mounting, tabletop device
Connections	
Connections	Connection for the plug-in power supply, RS485 IN, RS485 + Power OUT
Max. range	
RS485-Power Injector to the last Sunny SensorBox	492 ft.
Power supply	
Power supply via	Plug-in power supply
Power consumption	< 5 W in case of 5 Sunny SensorBox devices
Environmental conditions during operation	
Ambient temperature	-4 °F to +149 °F
Relative humidity	5 % to 95 %, non-condensing
Warranty, Certificates and Permits	
Warranty	5 years
Certificates and permits	www.SMA-America.com

Plug-in power supply

General data	
Dimensions (W/H/D) in inches	4.24/2.27/1.32
Weight	10.58 oz
Mounting location	indoors
Power supply	
Input voltage	100 V - 240 V AC, 50 / 60 Hz
Output voltage	12 V DC ± 2 %
Output current	max. 2.5 A
Warranty	
Warranty	5 years

Module Temperature Sensor

General data	
Sensor resistor	PT100
Mounting location	outdoors
Connection cable	
Connection cable (for 2-conductor technology)	Pre-configured cable length of 8.2 ft.
Measured values	
Accuracy	± 0.9 °F

Measuring range	-22 °F to +176 °F
Resolution	0.18 °F
Warranty	
Warranty	5 years

12.1 FCC Compliance Information

FCC Compliance Information

SMA system monitoring unit, Model Sunny SensorBox

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

(1) This device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.
- The user is cautioned that changes or modifications not expressly approved by SMA America, Inc. could void the user's authority to operate this equipment.

Contact SMA America for more information.

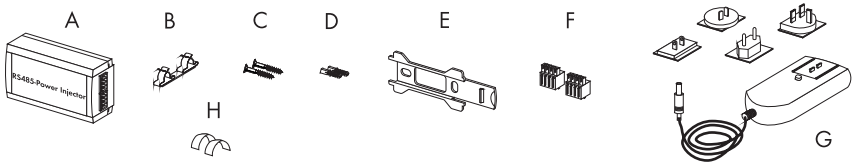
13 Accessories

13.1 Mounting accessories

	SMA order number
Roof bracket for mounting the Sunny SensorBox	Roofan-Ssensor
Mounting plate for mounting the Sunny SensorBox	Monplat-Ssensor

13.2 RS485-Power Injector

SMA order number: Power-Injector



A	1	RS485-Power Injector
B	1	Shield clamp
C	2	Screws
D	2	Screw anchor
E	1	Wall mounting bracket
F	2	Plug (4-pole)
G	1	Plug-in power supply with adaptors
H	2	Conductive adhesive foil

13.3 Seals of the Sunny SensorBox

NOTICE!

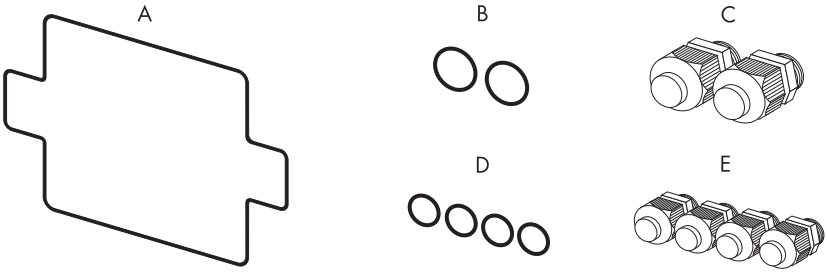
Due to porous rubber seals water can enter the Sunny SensorBox.

Damage to the Sunny SensorBox.

The rubber seal in the Sunny SensorBox lid becomes porous over the course of time, and will no longer provide a tight seal if the Sunny SensorBox is then opened. In case you will open the Sunny SensorBox after an operating lifetime of more than 5 years, e. g. for upgrading the device, the rubber seal in the Sunny SensorBox lid must therefore be replaced with a new one. In this case, order a replacement seal before starting maintenance works.

13.3.1 Packing List

SMA order number: Sealkit-Ssensor



A	1	Enclosure seal
B	2	Cable gland seals for the RS485 communication bus
C	2	Cable glands for the RS485 communication bus
D	4	Cable gland seals for the sensors
E	4	Cable glands for the sensors

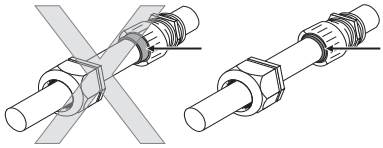
13.3.2 Replacing the Cable Gland Seal

NOTICE!

Ingress of water when mounting and installing the Sunny SensorBox.

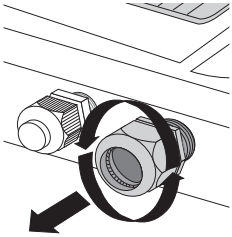
Damage to the Sunny Sensor Box.

- When working outdoors, make sure that no liquids (e. g. rain or snow) enter the open Sunny SensorBox.
- When inserting and removing the cable through the cable gland, make sure that the grommet correctly fits into the cable gland.

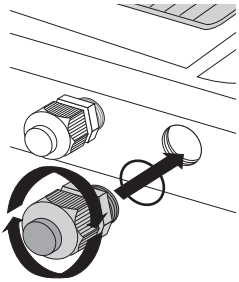


1. Pull the RS485-Power Injector's plug-in power supply out of the socket.
2. Open the Sunny SensorBox as described in section 10.1 "Opening the Sunny SensorBox" (page 51).
3. Remove the connection cables of the respective sensor or the RS485 cable in the Sunny SensorBox in the sequence opposite to the connection.

4. Unscrew old cable gland from the Sunny SensorBox in a counterclockwise direction. The cable gland directly rests against the Sunny SensorBox enclosure.



5. Place the appropriate seal ring on the thread of the new cable gland.



NOTICE!

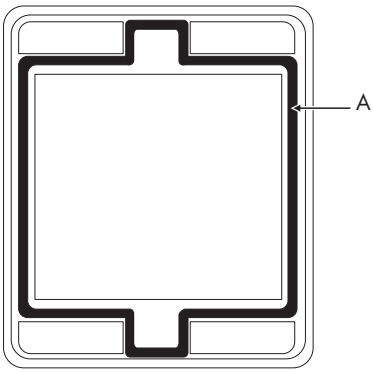
When fastening the cable gland, the seal ring can be damaged or it does not correctly fit on the cable gland's thread. The Sunny SensorBox is thus not tight.

Damage to the Sunny SensorBox.

- Ensure that the seal ring is correctly in place.

6. Screw the cable gland hand-tight in a clockwise direction (torque: 7 in-lbs) into the Sunny SensorBox.
7. Remove the porous rubber seal (A) in the Sunny SensorBox lid and replace with the new one.
8. Insert the sensor cable or the RS485 cable into the enclosure again and reconnect.
9. Ensure the grommets of the cable gland are correctly in place.
10. Screw the lock nut hand-tight onto the cable glands in a clockwise direction, in order to fix the cable (torque: 7 in-lbs).
11. Close the Sunny SensorBox as described in section 10.2 "Closing the Sunny SensorBox" (page 52).

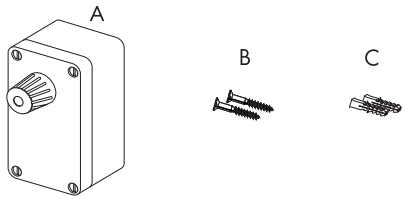
☑ The cable gland seal is replaced.



13.4 Ambient Temperature Sensor

13.4.1 Packing List

SMA order number,: TEMPSENSOR-AMB



A	1	JUMO PT100 Sensor
B	2	Screws
C	2	Screw anchor

13.4.2 Cabling Recommendations

The cable length and quality have an effect on the signal quality. To achieve a good quality signal, observe the following instructions regarding cabling:

Outdoors

For the outdoors, use a cable with the following key properties:

- Cross-section: min. 4 x AWG 24
- External diameter: min. 1.18 in., max. 0.28 in.
- UV-resistant
- The maximum cable length may not exceed 98 ft..

We recommend the following cable types:

- UL-listed Lapp cable: UNITRONIC LifY11Y 4 x 0.34 mm², order no.: 7038 865

Indoors or Using a Cable Channel

If you protect the cable from UV radiation outdoors by means of a suitable cable channel, you can also use a non-UV-resistant (indoor) cable with the basic properties mentioned above.

We recommend the following cable types:

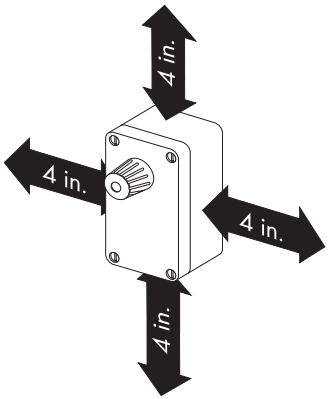
- UL-listed Lapp cable: UNITRONIC LiYY UL/CSA 4 x AWG22/7, order no.: 0022 604

13.4.3 Selecting the Mounting Location

- The ambient temperature sensor must be installed with the cable gland pointing downwards in order to prevent water from accumulating on the cable gland.
- Select an installation location which is in shade throughout the entire day.
- Make sure that heat cannot accumulate at the installation location (e.g. by means of an overlapping roof).
- Protect the ambient temperature sensor from severe soiling.
- Observe the maximum cable length of 98 ft. ranging from the ambient temperature sensor to the Sunny SensorBox.

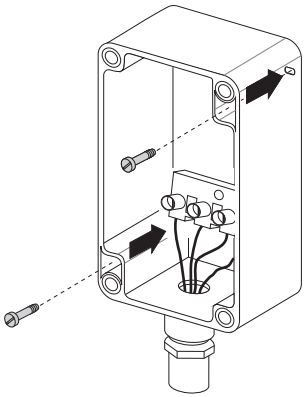
13.4.4 Mounting the Ambient Temperature Sensor

1. Unscrew the 4 screws on the sensor enclosure, and remove the lid.
2. Determine the mounting location taking into account the mounting space.
3. Hold the ambient temperature sensor to the wall and mark the positions of the drill holes. The drill holes are located on the top right and bottom left in the ambient temperature sensor.
4. Drill the holes (diameter: 15/64") and insert the screw anchors provided.



5. Fasten the sensor enclosure using the 2 screws provided.
6. Tighten the screws in a clockwise direction.

☑ The ambient temperature sensor is mounted.



13.4.5 Connecting the Ambient Temperature Sensor to the Sunny SensorBox

Connection in the Ambient Temperature Sensor

Cable length when connecting in a 4-conductor technology

In order to ensure accuracy even over longer distances, we recommend to connect the PT100 sensor resistor in a 4-conductor technology. The cable length may not exceed 98 ft.

1. Unscrew the 4 screws on the sensor enclosure, and remove the lid.
2. Unscrew the cable gland on the bottom of the sensor enclosure against a counterclockwise direction.
3. Remove the interior small protection plates. Make sure that the interior seal does not fall out.
4. Screw the cable gland halfway onto the sensor enclosure in a clockwise direction.
5. Thread the cable through the cable gland of the sensor.
6. Open the screw terminals in a counterclockwise direction.
7. Connect the insulated conductors to the sensor's terminals.

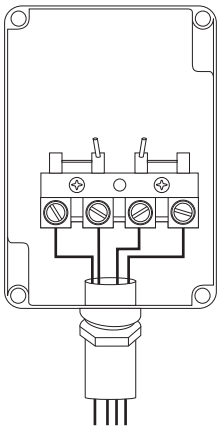
   Write down the color of the insulated conductors:

   I+:_____

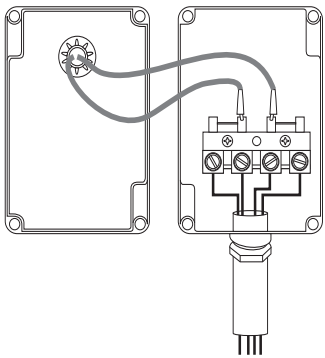
   V+:_____

   V-:_____

   I-:_____



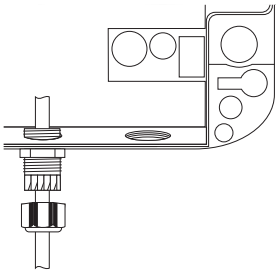
8. Close the screw terminals in a clockwise direction.
9. Pull the insulated conductor to check that it is securely in place.
10. Screw the sensor's cable gland hand-tight in a clockwise direction into the sensor enclosure (torque: 7 in-lbs).
11. Plug the cables from the sensor lid onto the plugs. The polarity of the cables is arbitrary.



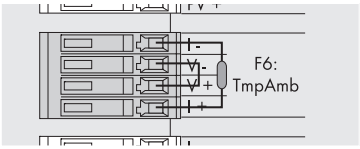
Connection to the Sunny SensorBox

12. Open the Sunny SensorBox as described in section 10.1 "Opening the Sunny SensorBox" (page 51).

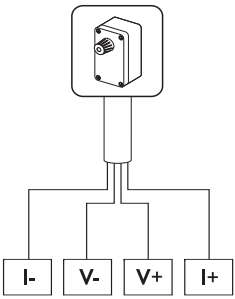
13. Unscrew the cable gland's lock nut in the bottom middle of the Sunny SensorBox in a counterclockwise direction and remove the filler plugs.
14. Thread the sensor cable through the lock nut and tighten the cable gland of Sunny SensorBox enclosure in a clockwise direction.



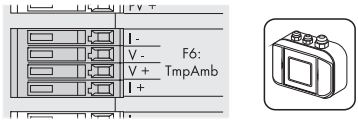
15. Remove the resistor and the bridge at the "F6: TmpAmb" terminal in the Sunny SensorBox as described in section 5.2.4 "Operating the Terminals for the Sensors" (page 30).



16. Connect the sensor to the "F6: TmpAmb" terminal of the Sunny SensorBox as described in section .5.2.4 "Operating the Terminals for the Sensors" (page 30) Note the indicated colors of the insulated conductors.
17. Ensure that the grommet of the cable gland is correctly in place.
18. Screw the lock nut hand-tight onto the cable gland in a clockwise direction, in order to fix the cable (torque: 7 in-lbs).
19. Lay the cable using suitable fastening material.
20. Mounting and connecting additional sensors.
21. Close the Sunny SensorBox as described in section 10.2 "Closing the Sunny SensorBox" (page 52).



☑ The ambient temperature sensor is connected.



13.4.6 Technical Data for the Ambient Temperature Sensor

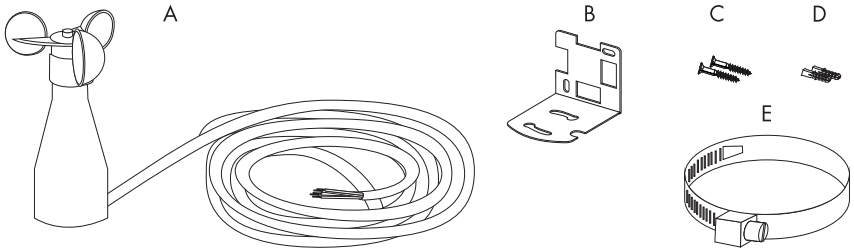
General data	
Dimensions (W /H /D) in inches	3.94/2.05/2.64
Sensor resistor	PT100
Mounting location	outdoors
Connection cable	
Connection cable (for 4-conductor technology)	max. 98 ft.

Measured values	
Accuracy	± 0.9 °F
Measuring range	-22 °F to +176 °F
Resolution	0.18 °F
Warranty	
Warranty	5 years

13.5 Anemometer

13.5.1 Packing List

SMA order number: WIND-SENSOR



A	1	Anemometer with a connection cable of 10 ft. and screws on the bottom side
B	1	Mounting bracket
C	2	Screws
D	2	Screw anchor
E	2	Straps

13.5.2 Cabling Recommendations

The cable length and quality have an effect on the signal quality. To achieve a good quality signal, observe the following instructions regarding cabling:

For the anemometer, you only need to use two of the four conductors.

The cable details indicated below describe a 4-wire cable. You can use a 2-wire cable with the same properties as well.

Outdoors

For the outdoors, use a communication cable with the following key properties.

- Cross-section: min. 4 x AWG 24
- External cable diameter: min. 0.16 in., max. 0.24 in.

- UV-resistant
- The maximum cable length may not exceed 98 ft..

We recommend the following cable types:

- UL-listed Lapp cable: UNITRONIC LifY11Y 4 x 0.34 mm², order no.: 7038 865

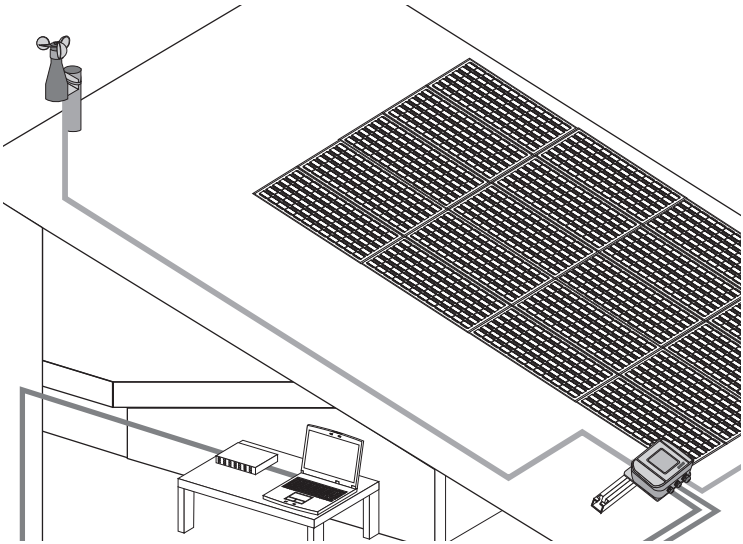
Indoors or Using a Cable Channel

If you protect the cable from UV radiation outdoors by means of a suitable cable channel, you can also use a non-UV-resistant (indoor) cable with the basic properties mentioned above.

We recommend the following cable types:

- UL-listed Lapp cable: UNITRONIC LiYY UL/CSA 4 x AWG22/7, order no.: 0022 604

13.5.3 Selecting the Mounting Location



- The anemometer must be mounted in a standing position; otherwise, water can enter the anemometer.
- The anemometer is to be installed on the end of a pole to one side.
- The installation location must not be shielded from the wind, or in the lee of, for example, a chimney or satellite dish.
- Observe the pre-configured cable length of 10 ft. The cable may be cut or extended to a maximum of 98 ft.

13.5.4 Mounting the Anemometer

NOTICE!

Ingress of water due to wrong mounting of the anemometer.

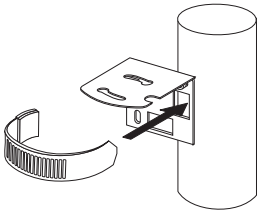
Damage to the anemometer.

- Mount the anemometer vertically.

Fasten the provided mounting bracket depending on the installation method:

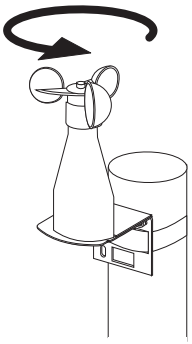
Pole mounting

1. Pull the clamp through the openings of the mounting bracket.
2. Position the mounting bracket on the upper end of the pole.
3. Tighten the clamp.
4. Turn the screw at the clamp in a clockwise direction.



5. Place the anemometer with its screws into the large cutouts of the mounting bracket.
6. Turn the anemometer in a counterclockwise direction up to the end of the narrow cut-outs.
7. Tighten the screws below the anemometer in a clockwise direction.

☑ The anemometer is mounted.

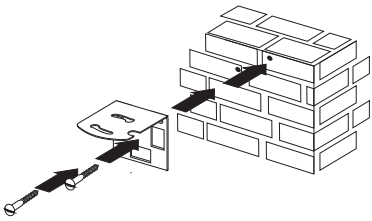


Wall Mounting

When mounting the anemometer on the wall, the mounting racket is mounted at the side end of a wall.

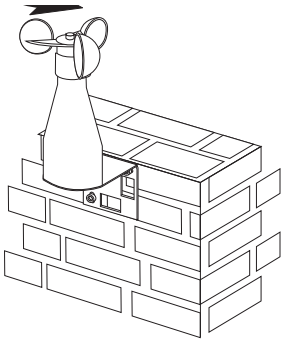
If the anemometer is mounted directly on the wall, turbulence may occur, which reduces the precision of measurements. We recommend a wall-pole mounting, in order to have more distance to the wall preventing turbulences.

1. Position the mounting bracket on the mounting location and mark the positions of the drill holes.
2. Drill holes (diameter: 15/64“) at the marked points and insert the screw anchors.
3. Attach the mounting bracket to the wall using 2 screws.



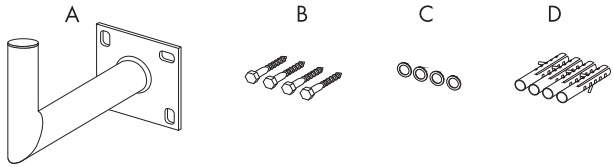
4. Place the anemometer with its screws into the large cutouts of the mounting bracket.
5. Turn the anemometer in a counterclockwise direction up to the end of the narrow cut-outs.
6. Tighten the screws below the anemometer in a clockwise direction.

☑ The anemometer is mounted.



Wall-pole mounting

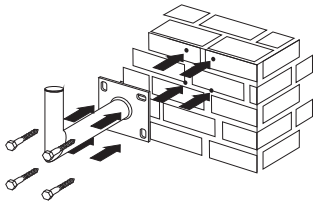
SMA order number:	Wall-Mount-Bracket



A	1	Wall mounting bracket
B	4	Hexagonal wood screws
C	4	Washers
D	4	Screw anchor

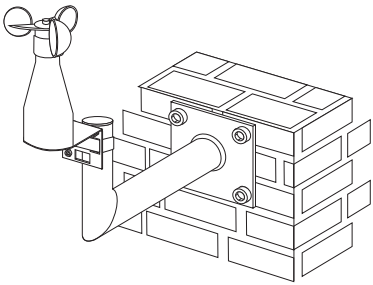
You require the optional wall mounting bracket for wall-pole mounting.

1. Position the wall mounting bracket on the mounting location and mark the positions of the drill holes.
2. Drill holes (diameter: 3/8“) at the marked points and insert the screw anchors.
3. Attach the wall mounting bracket to the wall using 4 screws and washers.



4. Mount the mounting bracket and anemometer as described in section "Pole mounting" (page 68).

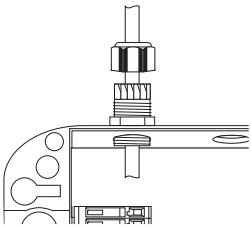
☑ The anemometer is mounted.



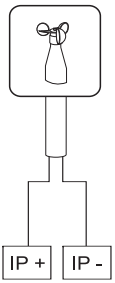
13.5.5 Connecting the Anemometer to the Sunny SensorBox

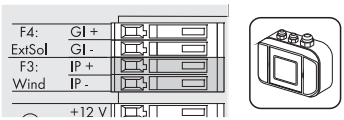
Connection to the Sunny SensorBox

1. Open the Sunny SensorBox as described in section 10.1 "Opening the Sunny SensorBox" (page 51).
2. Unscrew the cable gland's lock nut on the top left of the Sunny SensorBox in a counterclockwise direction and remove the filler plugs.
3. Thread the sensor cable through the lock nut and the cable gland at the top left into the Sunny SensorBox enclosure.
4. Loosely turn the lock nut in a clockwise direction onto the cable gland during further work.



5. The sensor is connected to the "F3: Wind" terminal of the Sunny SensorBox as described in section 5.2.4 "Operating the Terminals for the Sensors" (page 30).
6. Insert the insulated conductors into the clamps. The polarity of the insulated conductors is arbitrary.
7. Screw the lock nut hand-tight onto the cable gland in a clockwise direction (torque: 7 in-lbs).
8. Lay the cable using suitable fastening material.
9. Mounting and connecting additional sensors.
10. Close the Sunny SensorBox as described in section 10.2 "Closing the Sunny SensorBox" (page 52).





☑ The anemometer is connected.

13.5.6 Technical Data of the Anemometer

General data	
Electric output	Proportional frequency to the wind speed: 100 Hz at 89.4 mph
Weight	10.58 oz
Mounting location	outdoor
Applicability	Mounting bracket, wall mounting bracket (optional)
Measured values	
Accuracy	± 0.5 %
Measuring range	1.7 mph to 89.4 mph (max. 134.217 mph for a short time)
Resolution	1.31 ft. Wind run
Environmental conditions during operation	
Ambient temperature	-13 °F to +140 °F (if free of ice)
Warranty	
Warranty	5 years

14 Contact

If you have technical problems concerning our products, please contact the SMA Serviceline. We need the following information in order to provide you with the necessary assistance:

- Type of inverters and serial number
- Serial number and firmware version of the communication device
- Serial number and firmware version of the Sunny SensorBox

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